HOW CAPITAL STRUCTURE AND PRICE RATIOS AFFECT THE MARKET CAPITALIZATION AFTER FINANCIAL CRISIS

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Abstract

In this paper, we applied the Ohlson (1995) valuation model to evaluate the market capitalization of Toronto Stock Exchange-listed companies. The project focused on the relationship within the period after the financial crisis in 2007. Therefore, data were limited from 2010 to 2016. We split the enterprise value into assets and liabilities based on the theory proposed by Giner & Reverte (2001). With assuming different assets classes could influence a company's market capitalization to different extents, we conducted our stage two analysis by breaking assets into current and non-current assets. We also attempted to use price-to-book ratios as a replacement for market capitalization and formulated a multi-factor regression model using ratios in our stage three analysis. The results turned out that the Ohlson valuation model has the highest power of explanation, and some further research could be done to improve the model.

Keywords: The Ohlson (1995) valuation model; Market Capita; Multi-factor regression model.

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Introduction

The market capitalization, as a measure of a company's value, has been talked increasingly frequently. The value is not only influenced by a company's real wealth but also influenced by a perception of investors. Some arguments are saying that the companies listed in the US have been overvalued, which inspired us to investigate what factors would have more impacts on a company's market capitalization. Within this research project, our focus is to discover the factors which could affect the market capitalization based on multi-factor linear regression models with data retrieved from Toronto Stock Exchange-listed companies. Our method is to compare the coefficients of different categories from companies' capital structures during the period from 2010 to 2016 which we defined as "post-financial-crisis" period. The comparison has been conducted between years, and we use the adjusted R square as the evaluation of accuracy for regression models with the threshold value of 0.75.

In the beginning, we are inspired by the paper conducted by Begona & Carmelo (2001). Although the market capitalization is determined by the share price and the number of outstanding shares, we believe that a company's capital structure has a great impact on a company's market value, and further influences the company's stock price. Welch (2004) recognizes that "stock returns are a first-order determinant of debt ratios, that they are perhaps the only well-understood influence of debt ratio dynamics, and that many previously used proxies seem to have helped explain capital structure dynamics primarily because they correlated with omitted dynamics caused by stock price changes." Within this paper, we mainly focused on the effects of the composition of companies' capital structures from a static perspective regarding the comparison between years. After we achieved the result from 2010 to 2016, the regression models turned out that the determination coefficient dropped below the threshold value after 2012. The result

implies that the projection of a company's market capitalization cannot only be relied on its assets, liabilities, and earnings. During our stage II study, we focused on the period between 2013 and 2016. To further discover the different levels of impacts from different asset classes, we decided to break up assets into current assets and non-assets. Based on the discovery from Sharma & Kumar (2011), current assets have more impact on company's profitability such that the company's market capital can be influenced. Also, from some empirical study, especially high-tech companies listed in the US, companies with a high amount of cash, like Apple Inc., exhibits a higher amount of market value. Then, we also considered using ratios instead of dollar values to evaluate companies' performances, by which we can normalize the data to eliminate the effects of scales of companies. According to the discovery of Mohammad J. Abdolmohammadi (2005), "the empirical evidence on the nature and extent of disclosure of these IC categories and components by public companies are presented, and a highly significant and positive correlation between IC disclosure and market capital is found." The effect of intellectual property could place a strong influence upon a company's market capitalization. It is reasonable in include the percentage of R&D expense as a determinant to a company's market capital since investors have more bias onto companies with a strong motivation to innovate such that the company's share value would benefit. Regarding capital structures, we used equity ratio which is calculated by equity divided by assets. We also included profit margin and dividend yield to evaluate the company's ability to make money. Instead of using market capitalization, we used price/book ratio to evaluate the company's performance.

The structure of this paper is as follows. Literatures Review section presents our findings from current relevant research studies on factors impacting a company's market capitalization. Data and Summary Results present our retrieved data through 2010 to 2016 from Toronto Stock Exchange. Methodologies contain our method and relative

tests we used to conduct this research project. Results and Analysis provide our analysis of the findings and results from multi-factor regression models. Finally, Limitation and Conclusion present our conclusion and relative limitation of this paper.

1: Literature Review

The analyst has always analysed the relationship between the capital structure and the market capital to better understand how the capital structure affects the corporation's market perspective, and further predict the stock price of the corporation. The results are mixed depending on the time and the base country. Majority of the studies conducted similar methodology such as linear regression on the factors. In this section, we have presented the studies that were related to our paper and inspired us on the extension of our model.

Giner and Reverte (2001) tried to analyse the information value of firm capital structure by decomposing the book value of enterprise into total assets and liabilities to test whether investors price companies in a different way. Their paper focuses on all non-financial Spanish firms listed on the Madrid Stock Exchange. They employed the Ohlson (1995) model and found that the level of the debt-to-equity level will be perceived by the market, and the debt seems to be a positive signal for firms facing good prospects.

The perspective of the situation has been changing over the time. Our paper is based on the model in Giner and Reverte's paper and intends to test the market perspective by applying the model to data after the 2007/8 financial crisis. We focused on the Canadian market by using sample companies listed on the Toronto Stock Exchange.

Chauvin and Hirschey (1993) investigated whether advertising and research and development (R&D) expenditures will influence the market value of the firm. To be more specific, they used data from 1988 to 1990 and limited their sample size for each regression to the top 20 COMPUSTAT firms regarding the tested factor. The result indicated that positive effects of advertising and R&D expenditures on the market value of both manufacturing and nonmanufacturing firms. It is important to note that even

advertising expense and R&D are different, they can be regarded as alternative forms of investment in intangible capital that is valued by the shareholders.

As intellectual capital (IC), another form of intangible asset shows significant growing acceptance, Maditinos, Chatzoudes, etc. (2011) examined the impact of IC on firms' market value and financial performance. Their findings, however, contradicted to the positive relationship between the intangible asset and the market capital. They used the data from a panel consisting of 96 Greek companies listed on the Athens Stock Exchange (ASE) over the three-year period of 2006 to 2008. They examined various regression model to test this hypothesis. However, the result from the regression failed to support most of the hypotheses. They concluded that "despite the fact that IC is increasingly recognized as an important strategic asset for sustainable corporate competitive advantage, the result of the present study give rise to various arguments, criticism and further research on the subject" (Maditinos, Chatzoudes, etc., 2011).

To evaluate the significance of intangible asset including intellectual capital and R&D expenditure in the years after the financial crisis, we will run a modified multi-factor regression with relevant factors that reflect firms' level of investment in intangible assets. This will help us to understand whether the intangible asset has become more significant regarding the regression test. As some firms may in industries that do not compete on their intangible advantages, we might have limited data to run the model while generating the data.

Sharma and Kumar (2011) considered the effect of working capital on Indian firms. They discovered that working capital management and profitability is positively correlated in Indian companies that are significantly different from the various international studies. However, since their paper is based on the companies in an emerging market, our paper will test on the working capital to see whether this assumption applies to the developed market, such as Canada market in our model. In addition to the working capital, Sharma

and Kumar run a regression between the Return on Asset, which is expressed as a ratio, and the independent factors. This inspired us to think of using ratios as inputs to the regression in the process of analyzing. By using ratios as input instead of absolute numbers, the impact from the absolute value of the company will be eliminated. Foerster and Sapp (2006) in their study examined the how the role of dividends has changed in the valuation of equity. As the firm and investor behaviors have changed over time and across economic conditions, the return value of the dividends has changed as well. They considered the actual prices and dividend payments for the S&P Composite Index over the period from 1871 to 2005. Their result indicated that dividend has an impact on the company value since their dividend-based valuation methods perform relatively well at explaining the actual prices for the sample companies. To enhance our model in explaining the market value of the companies, we will also test the dividend factor in our model. In this way, we will be able to test if the investors in Canada market after the financial crisis value the dividend as much as indicated in this paper. Closer examination of the literature on the relationship of capital structure and market capital, in general, supports the fact that the allocation of capital has an impact on the firms' market capital. This motivates us to explore the nature of the relationship between capital structure and market capital of Canadian public firms, which forms the basis of the study.

2: Data and Summary Statistics

2.1 Sample and Data

As mentioned earlier, our data are retrieved from Orbis database. As we are focusing the research on the Canadian market, we used Toronto Stock Exchange (TSE), broad market indices of business from Canada and abroad, as our database. There are 1141 companies listed on TSE. The sample companies consist of the companies with full annual data of the variables required on each stage during 2010 to 2016. The sample for each year was constructed as follows. Firms are not required to be available during the study period of the year 2010 to 2016 since we are taking the market for each year as one sample set. Some firms with missing data were also removed from the sample. Table 3.1 shows the data selection procedure for stage I.

Table 2.1 Stage I Sample Selection Procedure

Year	2010	2011	2012	2013	2014	2015	2016
Firm listed on TSX	1140	1140	1140	1140	1140	1140	1140
Less: Firms with incomplete data	664	575	547	504	476	456	431
Firm included in the final sample	476	565	593	636	664	684	709

As we will discuss later, the results from the stage one show that the model is less effective from 2010 to 2016. Starting from 2013, the R square that used to indicate how close the data are to the fitted regression line, dropped below .75. To increase the accuracy in these years, we implemented a second stage multi-factor regression with asset decomposed to the current and non-current asset. The sample was being selected again for stage two according to the new variables. Table 3.2 shows the data selection procedure for stage II.

Table 2.2 Stage II Sample Selection Procedure

Year	2013	2014	2015	2016
Firms listed on TSX	1139	1139	1139	1139
Less: Firms with incomplete data	505	478	457	432
Firm included in the final sample	634	661	682	707

To extend the analysis to a more comprehensive approach, as mentioned in the literature review, we used the ratios as input in stage three. As the inputs for this stage are different from the first two stages and more independent variables are included in this stage, the firm included in the final sample is far less than the first two stages. Table 3.3 shows the data selection procedure for stage III.

Table 2.3 Stage III Sample Selection Procedure

Years	2011	2012	2013	2014	2015	2016
Firm listed on TSX	1141	1141	1141	1141	1141	1141
Less: Firms with incomplete data	905	920	885	880	901	908
Firm included in the final sample	236	221	256	261	240	233

2.2 Variables

To analyze relationship between the market consensus of market capitalization and forecasted market capitalization, where forecasted market capitalization is defined as total asset plus total liabilities with debt plus earnings after tax of each company. To analyze the relationship in the first stage of our analysis, we will run the linear multi-factor regression. The independent variables are Total Assets, Total Liabilities and Earnings and dependent variable is Market Capitalization. Total Assets, Total Liabilities, and Earnings are obtained from each company's annual accounting report. Market

Capitalization is the defined as average daily value total shares outstanding multiplied by stock price in a given year.

In our regression, we added earnings after tax as we think earning after tax will have a positive effect on the Market Capitalization of a company. Most companies will have an increase in their stock price after a better than forecasted earnings report. The higher the total assets meaning, the greater the value of the marketable asset in general which increases the investor's confidence in the company, which is a good signal for a healthy balance sheet. Looking at total asset standalone is not a good choice since it is possible for the company to have high leverage ratio, so total liabilities will also have explanatory power on the Market Capitalization of a company.

Apart from these variables, we did not include any other variables in the first stage because we think these variables alone are sufficient to test our hypothesis. There are researchers who use control variables to minimize the effect of other possible explanatory variables or limit the noise of data statistics. We will include some of these variables in the second stage for further testing.

In the second stage, we separated total assets into current assets and non-current assets. Current asset is assets that can be reasonably expected to convert into cash within a year. Current assets can include cash and cash equivalents, accounts receivable, inventory, prepaid expenses, marketable securities, and other liquid assets that can be converted into cash. Non-current assets can be long-term investments of the company that the value of such asset cannot be realized within a year. For example, investments in other companies, intangible assets such as goodwill, patent, brand name, and PP&E (property, plant, and equipment) can all be classified as non-current assets.

In the second stage, we run a linear multi-factor regression, where current assets, non-current assets, total liabilities and earnings after tax are independent variables or explanatory variables, and where Market Capitalization is still the dependent variable.

The result of the regression will give us some information regarding how the Market Capitalization of a company is being affected by the used balance sheet and income statement reporting parameters.

In the third stage, as mentioned earlier in the literature review section, we will test the relationship between capital structure and market value regarding ratio. Instead of market capital in stage one, the dependent variable, market value is measured by Price to Book Value Ratio (P/B), which is calculated by dividing the closing price of the stock by the latest book value per share.

Dividend yield, profit margin, equity ratio and R&D expenses/operating revenue were used as the independent variable, or explanatory and price-to-book ratio was considered as a measure capital structure. The dividend yield is calculated as dividend payment divided by the firm's market capitalization. A higher dividend yield represents a higher dividend portion paid to the investors as a return. Instead of using the earnings for earlier steps, in this model, we used profit margin, which is calculated as net income divided by revenue. A company with more capability to generate net income will have a higher profit margin. We used equity ratio in stage three to represent the leverage ratio used by a company as it is calculated as total equity divided by total shareholders' equity plus total debt. To consider the intangible capital, we choose to add R&D expense/ operating revenue ratio as an independent variable. Among intellectual capital, advertising expense and R&D expenses, R&D is the most accessible data set that is most common in the companies' financial statements. However, with R&D expense data, we still encounter the issue of lacking sufficient data because not all the companies have a specified category for R&D expenses.

2.3 Descriptive Statistics

The tables below show the descriptive statistics of the variables used in this study. Since our variables are collected for multiple years, we grouped the statistics by Years. As you can see from the table, the average number of total assets have been increasing since 2010, which is expected as the stock market kept on moving up. The average number of total liabilities has also been increasing over the years, which is also expected because the overall explanatory fiscal policy increases the borrowing of companies over the years. Market Capitalization has been decreasing from 2010 to 2011, which suggest that the Market Capitalization is not always in sync with the book value of companies, and it does not seem to be a lag effect in place based on the steady increase from 2011. Average Earnings after tax, on the other hand, is like a roller-coaster based the statistics shown.

Table 2.4 Stage I Descriptive Statistics Mean

(m CAD)	2016	2015	2014	2013	2012	2011	2010
Total assets	13112.38	12295.57	11157.55	10172.14	9472.33	9118.22	8359.77
Total Liabilities and Debt	3258.38	3099.29	2759.97	2441.45	2053.28	2037.29	1919.79
Earnings after Tax	75.39	-27.10	88.67	28.30	84.06	112.65	103.14
Market capitalisation	3107.33	2637.85	2986.18	2782.79	2594.45	2560.22	3099.41

For the variables specified more in the second stage of our analysis, the descriptive statistics are different from what we saw in the first stage. The general trend for current assets, fixed assets, and total liabilities was going down. This is expected as the companies do not want to have too much debt on its statement to avoid constraint on future cash flows.

Table 2.5 Stage II Descriptive Statistics Mean

(the CAD)	2013	2014	2015	2016
Total Current Assets	595326.37	553268.52	562328.10	514616.25
Total Liabilities and Debt	3266019.42	3106154.48	2769843.20	2446931.84
Earnings after Tax	75672.57	-27094.02	88842.08	27675.44
Fixed assets	4266285.75	4019052.76	3621774.91	3218486.88
Market capitalisation	3094336.47	2625934.50	2981781.59	2780849.75

One thing to be noted is that the data has been formatted for values that are non-existing, which means if we do not have variable data for a given year for a given variable, we used N/A instead to keep the total observation number consistent. Now, this method would affect the descriptive statistics less effective because the total sample size is smaller.

3: Methodologies

Within this research project, the most used methodology is a multi-factor regression. Through the analysis of coefficients of the regression model, we are perceived to find out the influence of different factors toward market capitalization. Also, the comparison has been conducted between years to discover the change of impacts through the time. For each regression model, parameters contain coefficients and the intercept. The adjusted R-square has been used as the determination of coefficient, instead of R-square, to evaluate the power of projection of the model.

According to Gauss-Markov Theorem, the assumptions of an Ordinary Least Square require multi-factor estimators to be Best Linear Unbiased Estimators. Also, to test the coefficients are significant, we conducted F-test as follows:

H_0: $b_1 = b_2 = b_3 \ldots = b_k = 0$ v.s. H_a: at least one coefficient doesn't equal to 0.

$$\mathrm{F} = \frac{ESS/_k}{RSS/_{n-k-1}}$$

Based on the assumption of multi-factor regression models, we tested the existence of three types of violations, including multicollinearity, heteroscedasticity of error variance, and, the autocorrelation of error terms.

The test of multicollinearity was conducted using Variation Inflation Factors (Robert M O'Brien, 2007) as follows:

$$\mathrm{VIF} = \frac{1}{1 - R_k^2}$$

Usually, a VIF value under 10 represents no serious multicollinearity, and a VIF value under 4 represents no multicollinearity.

The tests for error term regarding heteroscedasticity and autocorrelation were conducted using MatLab programming functions.

During our research, the final target is to discover the factors which affect the value of a listed company's market capitalization within the period after the financial crisis. At the first stage, we were using a multi-factor regression model to test the relationship between market capitalization and assets, liabilities and earnings. The relation was studied in dollar value. We tested the significance of coefficients and the validity of the regression model. From years 2010 to 2016, the comparisons have been studied to examine the weight of influence among different factors regarding the change of time. At the same time, determination factor, adjusted R-square, has been compared to check the power of explanation of the model. We discovered the value of adjusted R-square experienced a significant drop after 2012, which led us to further discuss another possible model to evaluate the market value of a company.

Since the determination factors dropped since 2013, therefore, it is reasonable for us to include other factors to examine the relationship of market capitalization from our original multi-factor models. We broke up assets into current and non-current assets since we doubted that the current assets could influence a company's stock price to a different extent compared to its fixed assets. The results were compared with those from the first stage to further illustrate any potential improvements could be done, and this part of the discussion is included in Limitations.

Therefore, we entered the third stage by using ratios instead of dollar values to examine the relationship. During the third stage, we include dividend yield as a factor which would attract investors to buy a company's stocks. The original factors of assets of liabilities and assets have been translated into equity ratio, calculated as Equity/ (Equity + Debts), to include the influence from a company's leverage level. Earnings have been replaced as the profitability margin which is a better proxy to test a company's ability to make money, taking the size of the company into consideration. The dependent variable was used as the price-to-book ratio which has a positive correlation with a company's market

value and could be a good indicator of a listed company's performance. The main purpose of the second stage was to eliminate the influence of size factor. For example, a company with a large number of assets may experience a different level of impacts from the market compared with a relatively small company in dollar value standards. The methodology was still multi-factor linear regression model, which means F-tests and tests for Ordinary Least Square regression assumptions have been conducted as well. After we received the results from the stage 3, they turned out that the determination factors were even worse than our first two stages, which implied that the dollar-value regression models could better evaluate the change in a company's market capitalization.

4: Results and Analysis

4.1 Stage I: Assets, Liabilities, Earnings and Market Capital

During our first stage of this research project, according to Begona & Carmelo (2001),

Ohlson model, as follows:

$$P_{it} = \beta_0 + \beta_1 A_{it} + \beta_2 L_{it} + \beta_3 E_{it} + e_{it} \quad (2)$$

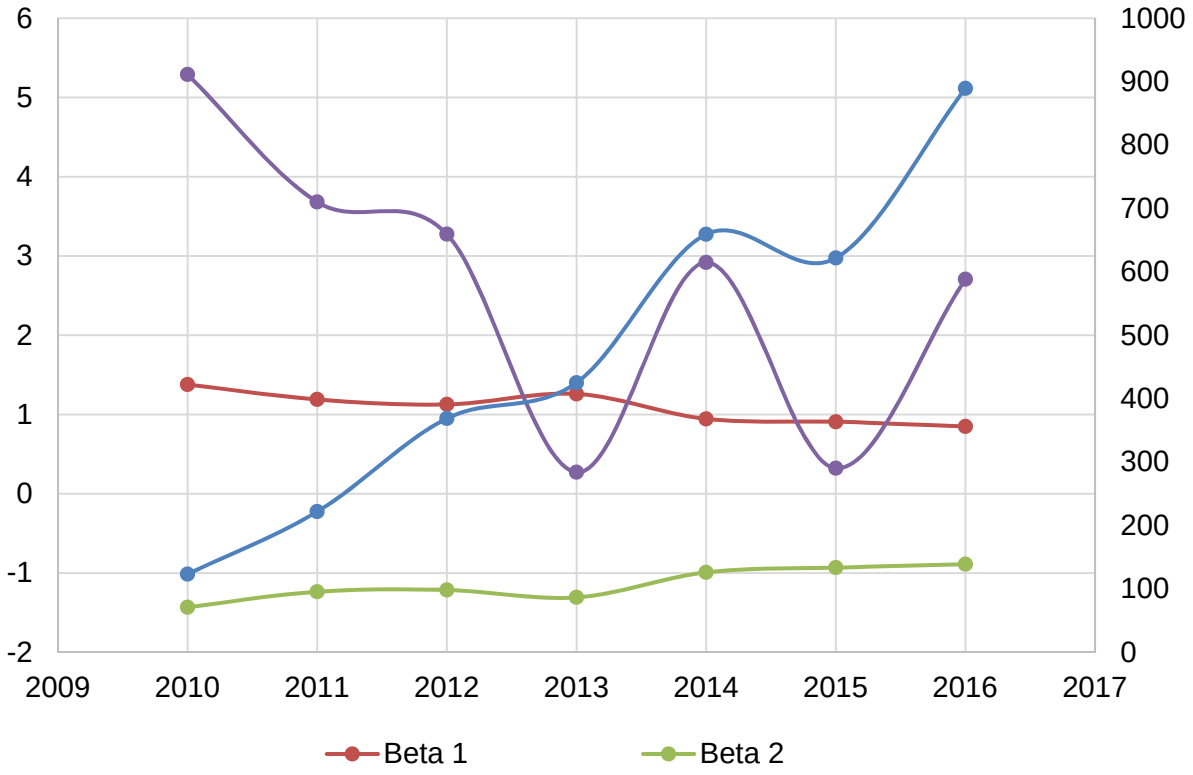
We changed the dependent variable, as P_{it}, companies' market capitalization, MK_{it}.

From 2010 to 2016, the following results of coefficients have been received:

Table 4.1 Stage I Model Results

Year	*intercepts*	*Assets*	*Liabilities*	*Earnings*	*Adjusted* R^2	*N obs.*
2010	123.3133	1.3785	-1.4311	5.2894	0.8728	476
2011	221.8429	1.1904	-1.2349	3.6811	0.8522	565
2012	368.8529	1.1270	-1.2137	3.2747	0.7814	593
2013	425.0816	1.2600	-1.3069	0.2718	0.6512	636
2014	659.2623	0.9449	-0.9905	2.9186	0.5884	664
2015	621.7935	0.9083	-0.9309	0.3233	0.5281	684
2016	889.2696	0.8501	-0.8880	2.7065	0.5549	709

Figure 4.1 Stage I: Coefficients Variations from 2010 to 2016



After we tested the significance of coefficients, all coefficients were significant and there was no multicollinearity existing since the maximum of VIF number was below 10. Coefficients with assets and liabilities were relatively stable. The values of coefficients of these two factors were close regarding absolute values, and liabilities had negative coefficients while assets had all positive coefficients. This could be understood since when a company has a higher amount of assets which could lead to a higher amount of total capitalization, while more liabilities a company has would lead to less equity from a company's balance sheet.

From the above figure we can see, the intercepts experienced a consistent increasing trend through all these years. The value in 2016 was almost eight times as the value in 2010. This increase happened with the decrease of the coefficient of R square. These two phenomena showed us the power of explanation from this multi-factor regression

decreased. Especially after 2013, the adjusted R square dropped a lot from 0.7814 to 0.6512. At the same time, coefficients of earnings also experienced fluctuating movements after 2012. These discoveries suggested us to change our method into a model breaking up the asset category to further study.

4.2 Stage II: Current/Non-Current Assets, Liabilities, Earnings and Market Capital

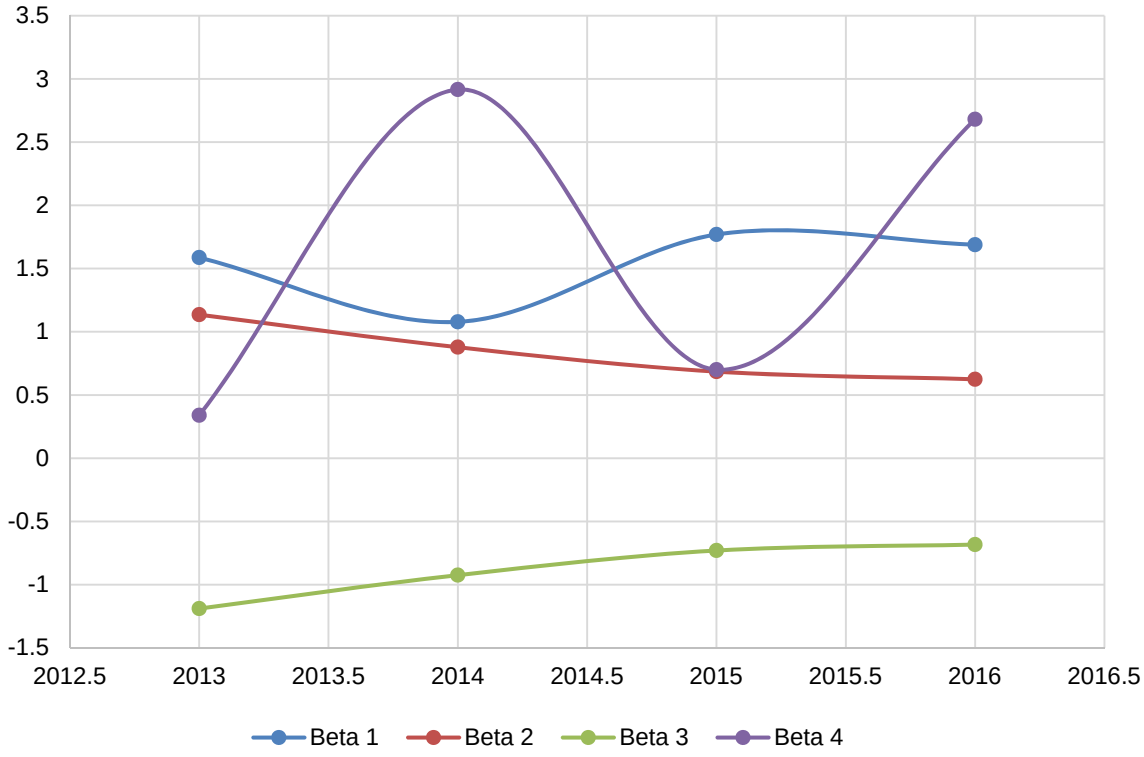
We conducted the second stage analysis to further investigate what happened after 2012. We conducted our approach as stated in equation (3), and results are presented below in table 5.2.

$$\text{Market Capital} = \beta_1 CA + \beta_2 NCA + \beta_3 L + \beta_4 E + \alpha + e_i \quad (3)$$

Table 4.2 Stage II Model Results

Year	*intercepts*	*Current Assets*	*Non-current Assets*	*Liabilities*	*Earnings*	*Adjusted R^2*	*N obs.*
2013	360920	1.5873	1.1354	-1.1894	0.3396	0.6576	634
2014	632143	1.0786	0.8779	-0.9248	2.9164	0.5886	661
2015	431556	1.7694	0.6847	-0.7305	0.7001	0.5741	682
2016	663683	1.6882	0.6245	-0.6833	2.6816	0.5862	707

Figure 4.2 Stage II: Coefficients Variations from 2010 to 2016



From above results, we could see that coefficients of determination increased from 2013 to 2016. However, the changes were so little that we couldnot say the equation (3) has a stronger explanation than equation (2). Even though, we can till observed some difference. For example, in 2015 and 2016, the coefficients of current and non-current assets had a significant difference, which in further suggested our separation between these two classes was meaningful in some extend. Besides, we can see the coefficients of liabilities are close to the absolute values of coefficients of non-current assets, which suggested that maybe we could improve this multi-factor regression model by separating liabilities in future.

4.3 Stage III: Profit Margin, Dividend Yield, Equity Ratio, R&D/Operating Revenue and P/B

During the third stage, we further extended our research by using ratios instead of dollar values to evaluate the factors which affect a company's P/B ratio such as to affect a company's market capital, based on equation (4), and the results are presented in table 5.3.

$$\frac{P}{B} = \beta_1 PM + \beta_2 Div + \beta_3 ER + \beta_4 R\&D + \alpha + e_i \quad (4)$$

Table 4.3 Stage III Model Results

Year	*Intercepts*	*Profit margin*	*Dividend Yield*	*Equity Ratio*	*R&D*	*Adjusted* R^2	*N obs.*
2011	1.7160	0.0081	-0.0008	-0.0713	0.2140	0.1088	236
2012	1.3420	-0.0114	0.0005	0.4065	-0.1671	0.0144	221
2013	1.6171	0.0096	-0.0010	-0.0095	0.2299	0.1008	256
2014	2.3240	0.0008	-0.0017	-0.1606	0.0891	-0.0101	261
2015	0.9914	-0.0741	-0.0025	0.1441	0.2021	-0.0047	247
2016	2.2175	0.0138	-0.0034	-0.2073	0.0803	-0.0090	233

From values of adjusted R squares, it is obvious that our hypothesis was wrong and there were no relations between price-to-book ratios and a company's profit margin, dividend yield, equity ratio, and, R&D expense ratio. We suggested that one possible reason could be that many companies did not have a consistent expense in research and development, and from our data, we can see that many companies even did not have any expense on R&D and this absence of data deteriorates the power of explanation of the model. Also, coefficients of other factors were also not consistent, which implied that the relationship between ratios are not linear and cannot be explained by the multi-factor regression model.

5: Limitation

There is certain limitation of this paper.

This paper focused on the company listed on the Toronto Stock Exchange only. This model will be more applicable to Canadian market rather than other countries gave that different countries have different situation and factors. The model will need to be adjusted if the analyst would like to apply the model to other country taking the unique characteristics of the target country into consideration. For example, for an emerging market, a factor reflecting the higher growth potential and the more volatile market should be added. As the sample companies used in this model are listed on the Toronto Stock Exchange, the companies are categorized as very large companies and are value stocks. The model in this paper may not apply to companies that are relatively smaller and in the growing stage with higher volatility.

To analyze the relationship between the company capital and its capital structure, we used financial statement data from Orbis for each company. However, these figures were extracted from the company's financial statement from each accounting year-end. It is important to note that companies have different accounting year-end. For example, Company A on the company list has an accounting year-end of December 31st, while company B has an accounting year end of January 31st. This implies that the input data that we used in the regression were not at the same time point. To simplify the case, we assumed that the data were all on Dec 31st for each year.

At last, when generating the data from Orbis, we deleted the company that does not have the required data, which decrease the sample size from 1147 listed company to approximately half of data sets. The lack of available data for the appropriate analysis decreased the accuracy. In further, regarding processing data, we could categorize data into different industries, which could be more reasonable since the market capitalization

has more similarity within the same industry. Besides, data on quarterly and monthly bases should also be taken into considerations to increase the size of observations.

6: Conclusion

In this paper, the Ohlson (1995) valuation model has been used to evaluate the listed companies from Toronto Stock Exchange during the period from 2010 to 2016. The whole research project was conducted in three stages. During the first stage, a company's assets, liabilities, and, earnings were regressed with market capitalization. From the results of the first stage, the power of explanation experienced a decrease after 2012. When we conducted the second stage, we split assets into current and non-current assets based on our assumption that different assets might have different impacts on the company's market capitalization. The results confirmed that different assets classes have different coefficients. However, the power of explanation did not increase. By conducting our stage three analysis, market capitalization was replaced by price-to-book ratios. We selected profit margin, dividend yield, and, R&D expense percentage, as independent variables. This stage showed that the ratios regression model has no power of explanation and coefficients varied without a consistent trend. All in all, our research project demonstrated that the Ohlson (1995) valuation model could be used to evaluate companies' market capitalization. However, some other factors not included might have impacts on the model based on our results from 2013 to 2016.

Appendices

Appendix 1: Stage I R Square and Adjusted R Square Summary

	2010	2011	2012	2013	2014	2015	2016
R Square	0.8736	0.8530	0.7825	0.6528	0.5903	0.5302	0.5568
Adjusted R Square	0.8728	0.8522	0.7814	0.6512	0.5884	0.5281	0.5549

Appendix 2: Stage I 2010 ANOVA Table

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	19902430822	6634143607	1087.265	1.7107E-211
Residual	472	2879992688	6101679.423		
Total	475	22782423509			

*(*m CAD)	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	123.3133	120.6240	1.0223	0.3072	-113.7131	360.3398
Total assets	1.3785	0.0652	21.1504	0.0000	1.2505	1.5066
Total Liabilities and Debt	-1.4311	0.0655	-21.8571	0.0000	-1.5598	-1.3025
Earnings after Tax	5.2894	0.4843	10.9207	0.0000	4.3377	6.2411

Appendix 3: Stage I 2011 ANOVA Table

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	15917355441	5305785147	1085.417	4.4E-233
Residual	561	2742306410	4888246.721		
Total	564	18659661851			

*(*m CAD)	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	221.8429	99.0678	2.2393	0.0255	27.2538	416.4320
Total assets	1.1904	0.0435	27.3355	0.0000	1.1049	1.2760
Total Liabilities and Debt	-1.2349	0.0444	-27.8056	0.0000	-1.3222	-1.1477
Earnings after Tax	3.6811	0.2998	12.2783	0.0000	3.0922	4.2700

Appendix 4: Stage I 2012 ANOVA Table

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	14535855243	4845285081	706.2864881	1.3337E-194
Residual	589	4040673241	6860226.216		
Total	592	18576528484			

(m CAD)	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	368.8529	113.8740	3.2391	0.0013	145.2043	592.5015
Total assets	1.1270	0.0401	28.0851	0.0000	1.0481	1.2058
Total Liabilities and Debt	-1.2137	0.0443	-27.3675	0.0000	-1.3008	-1.1266
Earnings after Tax	3.2747	0.3283	9.9756	0.0000	2.6300	3.9194

Appendix 5: Stage I 2013 ANOVA Table

	df	SS	MS	F	Significance F
Regression	3	15390895460	5130298487	396.094071	1.0798E-144
Residual	632	8185804537	12952222.37		
Total	635	23576699997			

(m CAD)	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	425.0816	150.7917	2.8190	0.0050	128.9683	721.1949
Total assets	1.2600	0.0413	30.5126	0.0000	1.1789	1.3411
Total Liabilities and Debt	-1.3069	0.0474	-27.5543	0.0000	-1.4000	-1.2137
Earnings after Tax	0.2718	0.2104	1.2919	0.1969	-0.1413	0.6849

Appendix 6: Stage I 2014 ANOVA Table

	df	SS	MS	F	Significance F
Regression	3	18104768473	6034922824	316.9741171	2.0562E-127
Residual	660	12565849542	19039165.97		
Total	663	30670618015			

(m CAD)	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	659.2623	179.2120	3.6787	0.0003	307.3680	1011.1566
Total assets	0.9449	0.0572	16.5287	0.0000	0.8326	1.0571
Total Liabilities and Debt	-0.9905	0.0620	-15.9642	0.0000	-1.1124	-0.8687
Earnings after Tax	2.9186	0.4149	7.0350	0.0000	2.1040	3.7332

Appendix 7: Stage I 2015 ANOVA Table

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	13252900710	4417633570	255.7636332	4.4206E-111
Residual	680	11745183592	17272328.81		
Total	683	24998084302			

(m CAD)	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	621.7935	167.6442	3.7090	0.0002	292.6309	950.9560
Total assets	0.9083	0.0398	22.8031	0.0000	0.8301	0.9865
Total Liabilities and Debt	-0.9309	0.0455	-20.4779	0.0000	-1.0202	-0.8417
Earnings after Tax	0.3233	0.2280	1.4181	0.1566	-0.1243	0.7708

Appendix 8: Stage I 2016 ANOVA Table

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	19266603740	6422201247	295.2075796	4.3058E-124
Residual	705	15337180315	21754865.7		
Total	708	34603784055			

(m CAD)	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	889.2696	182.8785	4.8626	0.0000	530.2179	1248.3213
Total assets	0.8501	0.0452	18.8283	0.0000	0.7615	0.9388
Total Liabilities and Debt	-0.8880	0.0500	-17.7648	0.0000	-0.9861	-0.7899
Earnings after Tax	2.7065	0.4707	5.7500	0.0000	1.7823	3.6306

Appendix 9: Stage II R Square and Adjusted R Square Summary

	2013	2014	2015	2016
R Square	0.6597	0.5911	0.5766	0.5886
Adjusted R Square	0.6576	0.5886	0.5741	0.5862

Appendix 10: Stage II 2013 ANOVA Table

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	1.55254E+16	3.88135E+15	304.9054641	1.1776E-145
Residual	629	8.00698E+15	1.27297E+13		
Total	633	2.35324E+16			

(th CAD)	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	360920.232	150645.644	2.3958	0.0169	65090.958	656749.506
Earnings after Tax	0.3397	0.2097	1.6198	0.1058	-0.0721	0.7515
Total Current Assets	1.5873	0.1007	15.7654	0.0000	1.3896	1.7850
Fixed assets	1.1354	0.0537	21.1552	0.0000	1.0300	1.2408
Total Liabilities and Debt	-1.1894	0.0573	-20.7690	0.0000	-1.3019	-1.0769

Appendix 11: Stage II 2014 ANOVA Table

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	1.80624E+16	4.51559E+15	237.0497718	8.1189E-126
Residual	656	1.24962E+16	1.90491E+13		
Total	660	3.05586E+16			

(th CAD)	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	632143.324	180046.499	3.5110	0.000	278606.391	985680.256
Earnings after Tax	2.9164	0.4159	7.0123	0.000	2.0998	3.7331
Total Current Assets	1.0786	0.1103	9.7814	0.000	0.8621	1.2952
Fixed assets	0.8779	0.0752	11.674	0.000	0.7303	1.0256
Total Liabilities and Debt	-0.9248	0.0784	-11.801	0.000	-1.0786	-0.7709

Appendix 12: Stage II 2015 ANOVA Table

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	1.42512E+16	3.5628E+15	230.496883	8.8179E-125
Residual	677	1.04644E+16	1.54571E+13		
Total	681	2.47156E+16			

(th CAD)	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	431556.77	160187.21	2.6941	0.007	117033.30	746080.24
Earnings after Tax	0.7001	0.2213	3.1637	0.001	0.2656	1.1346
Total Current Assets	1.7694	0.1099	16.0945	0.0000	1.5535	1.9853
Fixed assets	0.6847	0.0461	14.8452	0.0000	0.5942	0.7753
Total Liabilities and Debt	-0.7305	0.0491	-14.8661	0.0000	-0.8270	-0.6340

Appendix 13: Stage II 2016 ANOVA Table

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	2.01351E+16	5.03377E+15	251.0503662	8.6872E-134
Residual	702	1.40757E+16	2.00508E+13		
Total	706	3.42108E+16			

(th CAD)	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	663683.66	178111.804	3.7262	0.000	313988.032	1013379.306
Earnings after Tax	2.6816	0.4524	5.9280	0.0000	1.7934	3.5697
Total Current Assets	1.6882	0.1210	13.9544	0.0000	1.4507	1.9258
Fixed assets	0.6245	0.0534	11.6941	0.0000	0.5197	0.7294
Total Liabilities and Debt	-0.6833	0.0557	-12.2741	0.0000	-0.7926	-0.5740

Appendix 14: Stage III R Square and Adjusted R Square Summary

	2011	2012	2013	2014	2015	2016
R Square	0.1240	0.0323	0.1247	0.0055	0.0121	0.0084
Adjusted R Square	0.1088	0.0144	0.1108	-0.0101	-0.0047	-0.0090

Appendix 15: Stage III 2011 ANOVA Table

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	65.18885619	16.29721405	8.173902621	3.50818E-06
Residual	231	460.5702588	1.993810644		
Total	235	525.759115			

(%)	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	1.7160	0.1181	14.5312	0.0000	1.4833	1.9487
Dividend yield - average high-low	-0.0008	0.0005	-1.6447	0.1014	-0.0017	0.0002
Profit margin	0.0081	0.0044	1.8272	0.0690	-0.0006	0.0169
Equity Ratio	-0.0713	0.0514	-1.3856	0.1672	-0.1726	0.0301
R&D expenses / Operating revenue	0.2140	0.0456	4.6948	0.0000	0.1242	0.3039

Appendix 16: Stage III 2012 ANOVA Table

	df	SS	MS	F	Significance F
Regression	4	84.39215514	21.09803878	1.803623845	0.129210134
Residual	216	2526.677827	11.69758253		
Total	220	2611.069982			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	1.3420	0.4126	3.2524	0.0013	0.5287	2.1553
Dividend yield - average high-low	0.0005	0.0011	0.4623	0.6443	-0.0016	0.0026
Profit margin	-0.0114	0.0110	-1.0286	0.3048	-0.0331	0.0104
Equity Ratio	0.4065	0.3977	1.0223	0.3078	-0.3773	1.1904
R&D expenses / Operating revenue	-0.1671	0.0690	-2.4206	0.0163	-0.3032	-0.0310

Appendix 17: Stage III 2013 ANOVA Table

	df	SS	MS	F	Significance F
Regression	4	102.6828453	25.67071132	8.941932989	9.13064E-07
Residual	251	720.5766974	2.870823496		
Total	255	823.2595427			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	1.6171	0.1157	13.9791	0.0000	1.3893	1.8449
Dividend yield - average high-low	-0.0010	0.0006	-1.6903	0.0922	-0.0021	0.0002
Profit margin	0.0096	0.0045	2.1490	0.0326	0.0008	0.0183
Equity Ratio	-0.0095	0.0149	-0.6375	0.5244	-0.0388	0.0198
R&D expenses / Operating revenue	0.2299	0.0456	5.0370	0.0000	0.1400	0.3198

Appendix 18: Stage III 2014 ANOVA Table

	df	SS	MS	F	Significance F
Regression	4	54.19379523	13.54844881	0.352981398	0.841839505
Residual	256	9826.021741	38.38289742		
Total	260	9880.215536			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	2.3240	0.4568	5.0873	0.0000	1.4244	3.2236
Dividend yield - average high-low	-0.0017	0.0030	-0.5481	0.5841	-0.0076	0.0043
Profit margin	0.0008	0.0175	0.0481	0.9616	-0.0337	0.0354
Equity Ratio	-0.1606	0.1812	-0.8862	0.3763	-0.5174	0.1963
R&D expenses / Operating revenue	0.0891	0.1842	0.4836	0.6291	-0.2737	0.4519

Appendix 19: Stage III 2015 ANOVA Table

	df	SS	MS	F	Significance F
Regression	4	888.3396334	222.0849084	0.718760163	0.579859133
Residual	235	72611.08246	308.9833296		
Total	239	73499.4221			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.9914	1.3065	0.7588	0.4487	-1.5826	3.5654
Dividend yield - average high-low	-0.0025	0.0144	-0.1720	0.8636	-0.0309	0.0260
Profit margin	-0.0741	0.0447	-1.6580	0.0987	-0.1622	0.0140
Equity Ratio	0.1441	0.8357	0.1725	0.8632	-1.5022	1.7905
R&D expenses / Operating revenue	0.2021	0.4829	0.4186	0.6759	-0.7492	1.1534

Appendix 20: Stage III 2016 ANOVA Table

	df	SS	MS	F	Significance F
Regression	4	90.70776587	22.67694147	0.482279797	0.748741383
Residual	228	10720.62874	47.02030151		
Total	232	10811.33651			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	2.2175	0.5305	4.1799	0.0000	1.1722	3.2629
Dividend yield - average high-low	-0.0034	0.0078	-0.4295	0.6680	-0.0188	0.0121
Profit margin	0.0138	0.0198	0.7002	0.4845	-0.0251	0.0528
Equity Ratio	-0.2073	0.2411	-0.8600	0.3907	-0.6824	0.2677
R&D expenses / Operating revenue	0.0803	0.1821	0.4408	0.6598	-0.2785	0.4390

Appendix 21: Stage I Multi-collinearity Test

Year	2010	2011	2012	2013	2014	2015	2016
VIF	7.9106	6.8043	4.5975	2.8802	2.4408	2.1284	2.2562

Appendix 22: Stage II Multi-collinearity Test

Year	2013	2014	2015	2016
VIF	2.9390	2.4454	2.3619	2.4305

Appendix 23: Stage III Multi-collinearity Test

Year	2011	2012	2013	2014	2015	2016
VIF	1.1415	1.0334	1.1425	1.0055	1.0122	1.0085

Reference List

Basuki, B & Sudibyo, A. (2017). Intellectual Capital Disclosure Determinants and Its Effects on Market Capitalization: Evidence from Indonesian Listed Companies, Faculty of Economics and Business, Universitas Airlangga, Surabaya, Indonesia

Fama, E & French, K, (1996), Multifactor Explanations of Asset Pricing Anomalies, The Journal of Finance, Vol. 51, No. 1 (Mar, 1996), pp. 55-84, published by Wiley for the American Finance Association.

Foerster, S. R. & Sapp, S.G. (February 15, 2006). Dividends and Stock Valuation:A Study From the Nineteenth to the Twenty-First Century.

Giner, B. & Reverte, C. (2001). Valuation implications of capital structure: a contextual approach. *The European Accounting Review 2001, 10:2*, 291–314.

Sharma, A.K., & Kumar, S. (2011). Effect of Working Capital Management on Firm Profitability: Empirical Evidence from India. *Global Business Review, 12, 1 (2011): 159–173.*

Chauvin, K. W. & Hirschey, M. (1993). Advertising, R&D Expenditures and the Market Value of the Firm.

Khrawish, H, Siam, W & Jaradat, M, (Jul 2010), The Relationships between Market Capitalization Rate and Interest Rate: Evidence from Jordan, Business and Economic Horizons, Vol 2, Issue 2, pp. 60-66.

Levine, R. & Zervos, S, (1995), Stock Market Development and Long-Run Growth, The World Bank Economic Review, Vol 10, NO. 2, pp. 323-339.

Lewis, C & Tan, Y, (2016), Debt-equity choices, R&D investment and market timing, School of Finance, Shanghai University of Finance and Economics, Shanghai 200433. China.

Maditinos, D., Chatzoudes, D., Tsairidis, C., & Theriou, G. (2011). The impact of intellectual capital on firms' market value and financial performance. *Journal of Intellectual Capital, Vol. 12 Issue: 1*, pp.132-151.

Maditinos, D., Chatzoudes, D., Tsairidis, C., & Theriou, G. (2011). The impact of intellectual capital on firms; market value and financial performance. Journal of Intellectual Capital, Vol. 12 Issue: 1, pp.132-151.

Mohammad J. Abdolmohammadi, (2005) "Intellectual capital disclosure and market capitalization", Journal of Intellectual Capital, Vol. 6 Issue: 3, pp.397-416,

O’BRIEN, R, (2007), A Caution Regarding Rules of Thumb for Variance Inflation Factors, Department of Sociology, University of Oregon, Eugene, OR 97408, USA.

Rajan, R. & Zingales, L. (Dec 1995), What Do We Know about Capital Structure? Some Evidence from International Data. The Journal of Finance. Vol L. No 5.

Sharma, A.K., & Kumar, S. (2011). Effect of Working Capital Management on Firm Profitability: Empirical Evidence from India. Global Business Review, 12, 1 (2011): 159–173.

Welch, I (2004), Capital Structure and Stock Returns, Journal of Political Economy, Vol. 112, no. 1, pt. 1, University of Chicago.